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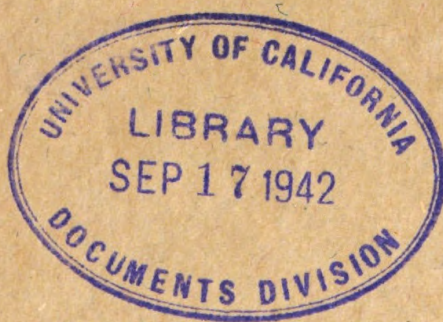
*U115 Dept of Army*  
**WAR DEPARTMENT**

**TECHNICAL MANUAL.**

**ORDNANCE MAINTENANCE**

**20-MM AUTOMATIC GUN M1  
AND  
20-MM AIRCRAFT AUTOMATIC  
GUN AN-M2**

**August 7, 1942**





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TECHNICAL MANUAL }  
No. 9-1227



WAR DEPARTMENT,  
WASHINGTON, August 7, 1942.

## ORDNANCE MAINTENANCE

### 20-MM AUTOMATIC GUN M1 AND 20-MM AIRCRAFT AUTOMATIC GUN AN-M2

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\*This manual supersedes TM 9-1227, January 24, 1942.

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## SECTION I

## GENERAL

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**1. Scope.**—This manual is published for the information and guidance of ordnance maintenance personnel. It contains detailed instructions for inspection, maintenance, and repair of the 20-mm aircraft automatic gun AN-M2 and 20-mm automatic gun M1, supplementary to those in the Field and Technical Manuals prepared for the using arm. Additional descriptive matter and illustrations are included to aid in providing a complete working knowledge of the matériel.

**2. Characteristics.**—The 20-mm, 2,850-foot per second automatic gun is a combination blowback and gas-operated aircraft weapon. The gun is air-cooled and has a cyclic rate of fire of 600 to 700 rounds per minute. It is designed for mounting as a fixed gun in the wing or fuselage of an airplane. It may also be mounted to fire through the hub of the propeller.

**3. Differences in models.**—The differences between the M1 and AN-M2 guns are in manufacture only; they do not affect troop use or care, but are useful as means of identifying the different models. The guns are identical with respect to the construction of the tube and the working parts, the only differences being in the dimensions of some of the receiver parts. The AN-M2 receiver is 0.2 inch longer than the M1. Each receiver slide of the AN-M2 gun has a projection which fits into a slot in the receiver side and the receiver slide bolts are locked by cotter pins. In the M1 gun each receiver slide has a head flange which overlaps the bottom face of the receiver side and the receiver slide bolts are locked by locking wire. In some M1 guns the receiver slides have no head flanges and the slides are riveted instead of bolted to the receiver sides. The shoulders on the bottom faces of the receiver sides serve as further means of identifying the M1 gun.

**NOTE.**—The AN-M2 gun is the new model designation for the M2 gun with which the using arm is already provided. The M2 and AN-M2 guns are identical.

**4. Data.**

Weight of M1 gun without magazine .....	pounds..	112
Weight of AN-M2 gun without magazine .....	do....	118
Weight of tube .....	do....	47.5
Weight of magazine, 60-round, 20-mm, M1 .....	do....	22
Weight of mechanism, feed, 20-mm, M1 .....	do....	19



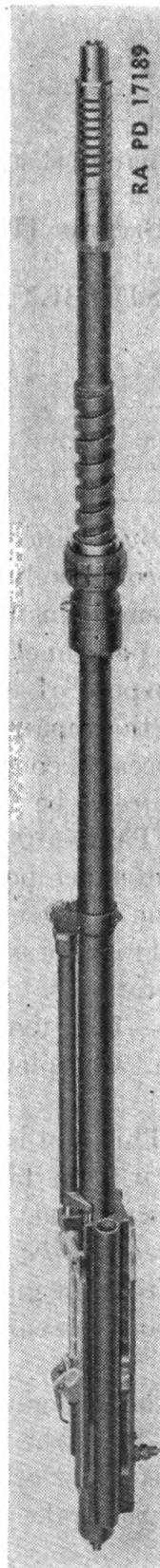


FIGURE 1.—Right side of gun.

(5) Fit muzzle brake wrench over the splines on rear muzzle brake ferrule and unscrew rear ferrule from muzzle brake body assembly.

(6) Remove washer and straighten it.

*b. Mounting sleeve group* (fig. 3).—(1) Remove recoil spring and two sleeves, as described in TM 9-227.

(2) Remove mounting sleeve group.

(3) Unscrew lubricant fitting.

(4) Unscrew mounting body and remove mounting sleeve nut.

(5) Remove dashpot cylinder bushing.

(6) Remove dashpot piston and washer from dashpot cylinder.

*c. Breechblock pin*.—(1) Remove breechblock pin taper pin.

(2) Remove breechblock pin.

*d. Sear cover insert*.—Tap out insert by inserting a drift through the two holes in bottom side of sear cover plate.

*e. Tube assembly*.—(1) Remove gas cylinder sleeve as described in TM 9-227.

(2) Remove cotter pin from lower front part of the receiver.

(3) Screw tube locking pin tool into tube locking pin and remove the pin by turning the tool (fig. 4).

(4) Unscrew tube assembly from the receiver.

*f. Ejector assembly*.—(1) Drive out ejector stud pin which locks the ejector stud (fig. 10) into the ejector.

(2) Unscrew ejector stud.

**8. Assembly.**—For the most part, assembly is carried out in the reverse order of disassembly.

*a. Muzzle brake assembly*.—(1) When assembled, the locking flats on the rear ferrule and the muzzle brake must not line up closer than  $\frac{1}{8}$  inch.

(2) Bend muzzle brake washer over the locking flats on rear ferrule and muzzle brake body.

(3) Stake front ferrule to muzzle brake body.

*b. Mounting sleeve group*.—When assembling, make sure that the lubrication fitting holes in the dashpot cylinder, mounting body, and dashpot cylinder bushing are in line for the lubrication fitting.

*c. Sear cover insert*.—Assemble with tapered edge toward the rear of the sear cover plate.

*d. Tube assembly*.—Coat ground threads with antiseize compound before assembling the tube assembly to the receiver.



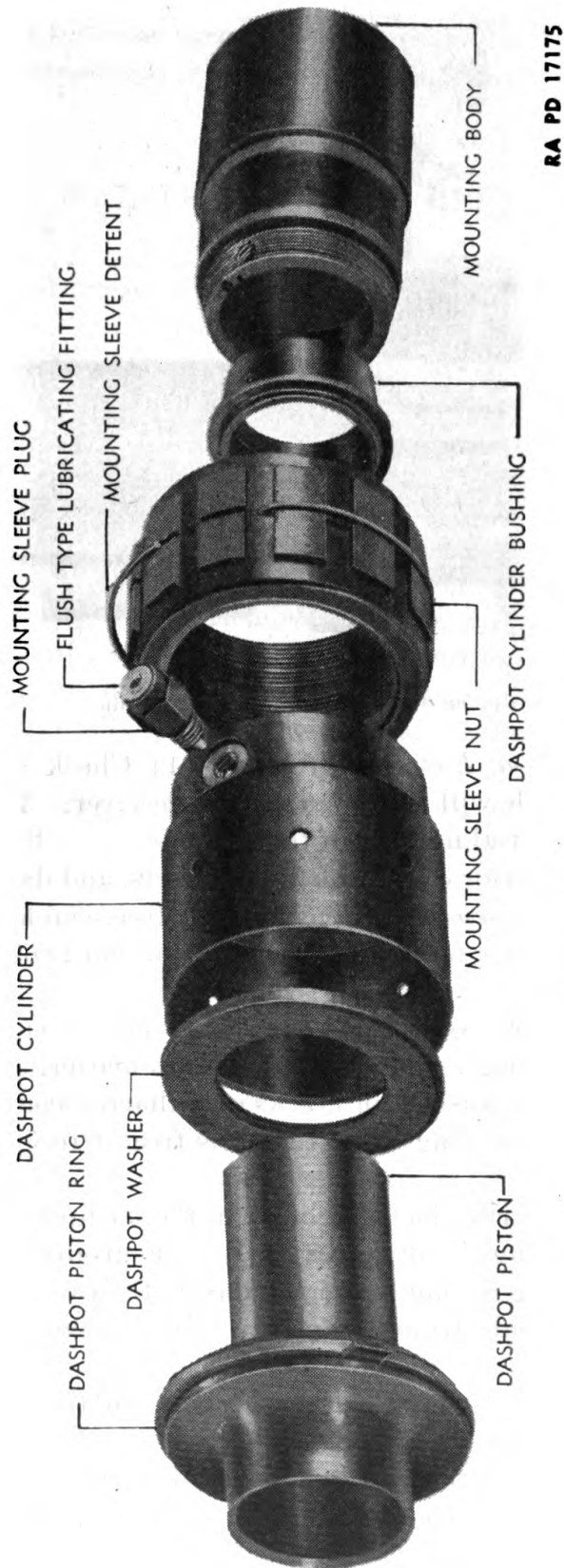


FIGURE 3.—Mounting sleeve group.

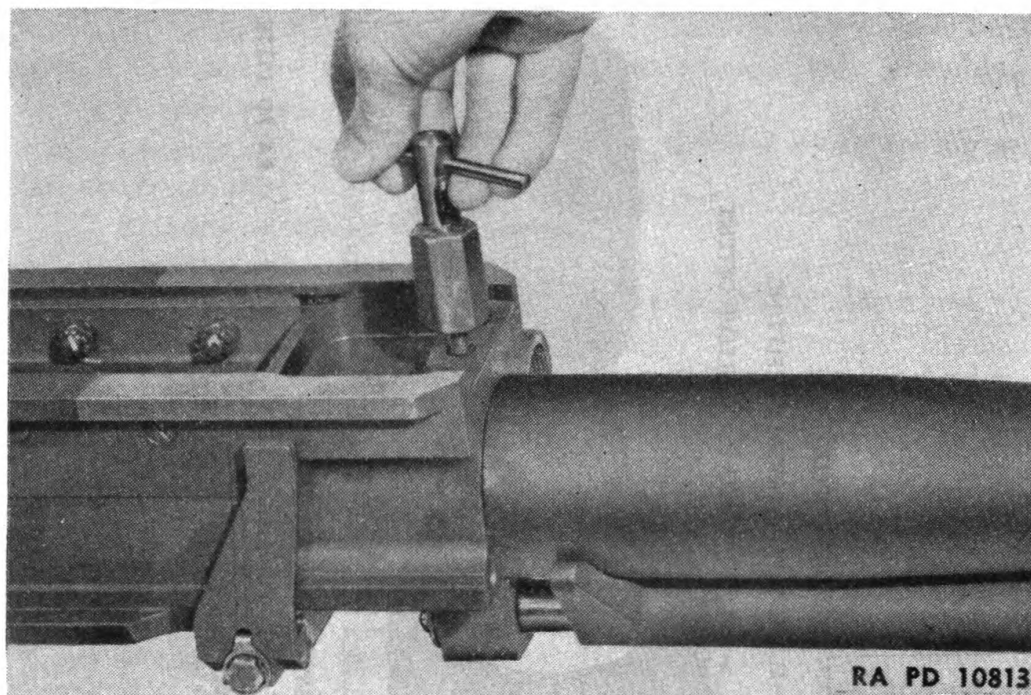


FIGURE 4.—Removing tube locking pin.

**9. Inspection.**—*a. Exterior of gun.*—(1) Check and record the serial number which will be found on the receiver. The number on the tube is not the serial number of the gun.

(2) Examine exterior of gun for rust, defects, and damages.

*b. Muzzle brake assembly.*—Remove and disassemble muzzle brake assembly and examine for wear, rust, carbon, and broken or missing parts.

*c. Mounting sleeve assembly.*—(1) Examine interior of dashpot cylinder for wear, rough surfaces, and foreign matter.

(2) Examine fibre washer for cracks or a charred condition.

(3) Examine piston ring to see that it is free of foreign matter and excessive wear.

(4) Note that the ring has a tight fit in the dashpot cylinder.

(5) The piston ring should move freely in its groove.

(6) With the ring assembled in the dashpot, clearance between the ends of the ring should be not less than 0.002 inch and not more than 0.005 inch.

(7) When the ring is free, clearance between the ends should be approximately 0.028 inch.

*d. Tube.*—(1) Check tube for looseness in the receiver.

(2) Inspect tube for condition of threads and splines at forward end of the tube.



(3) Examine bore for excessive wear of the lands. A bore gage is now being developed and will be issued when available.

### SECTION III

## MAINTENANCE AND REPAIR

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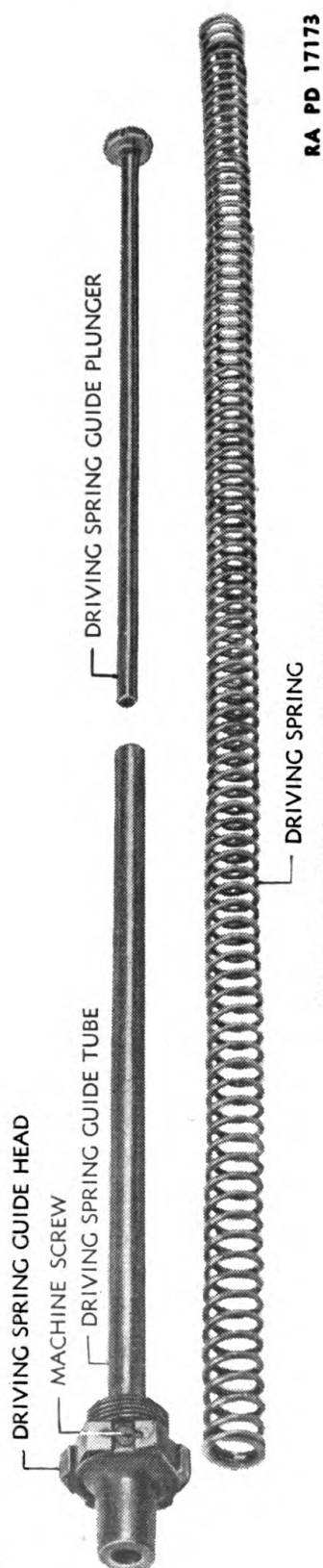
**10. Exterior of gun.**—Remove all burs and refinish rough surfaces on exterior of gun. Remove rust or corrosion with steel wool and then coat with oil, lubricating, preservative, light. Paint surfaces, which were originally painted, with lusterless olive-drab synthetic enamel.

**11. Driving spring guide group (fig. 5).**—*a.* Chase out threads in the rear buffer and guide head, if necessary. The threads are 25-mm-1.5-mm pitch, international form.

*b.* If necessary, bevel the mouth of guide tube at the forward end to insure free movement of plunger.

*c.* The guide tube should be perfectly straight and form a 90° angle with the forward face of guide head. Dents or bends will interfere with functioning of the weapon. A bent tube can be straightened by revolving it in a lathe and applying pressure against the bend. Deep dents are difficult to remove. If shallow dents cannot be removed by use of a  $\frac{5}{16}$ -inch expansion reamer on the interior of the tube, replace the tube.

*d.* The guide tube and head are assembled by sweating. The procedure is as follows: Thoroughly clean the threads to be sweat together on both the driving spring guide tube and the guide head. Heat to solder melting temperature, 475° F. Tin both threads with resin core string solder or 50/50 solder, using soldering paste as a flux. Assemble while solder tinning is at a free melting temperature. Assemble the two parts so that the locking screw openings are alined. Allow parts to cool to room temperature. Chase out locking screw threads with a No. 8-32NC-2 bottoming tap to insure proper fit of the locking screw. Tighten screw securely and stake in position.



RA PD 17173

FIGURE 5.—Driving spring guide group.



**12. Rear buffer group** (fig. 6).—*a.* The mating threads in rear end of housing and guide assembly are 25-mm-1.5-mm pitch, international form. These may be chased out when necessary.

*b.* Threads in front end of housing and in sleeve are 52-mm-1.5-mm pitch, international form. These threads may require cleaning or chasing out due to infrequent disassembly. Stake threaded sleeve into rear buffer housing in four places before gun is put into operation to insure against the unscrewing of the threaded sleeve during the firing of the gun.

*c.* If necessary, file or stone the dovetail sides of the housing to make a good push fit to the receiver. If fit is too tight, it will tend to spread the receiver; if too loose, it will cause the housing to hammer the receiver. Remove all sharp corners.

*d.* Remove all burs from the lock plunger but take off no more metal than is absolutely necessary. Removal of excess metal will cause the plunger to fit loosely and allow the rear buffer group to move vertically in the receiver. A crushed or dented rear buffer lock bushing will hinder free operation of the plunger and should be replaced.

**13. Breechblock assembly** (fig. 7).—*a.* Polish bolt assembly with an oilstone or crocus cloth to remove all burs and rough surfaces.

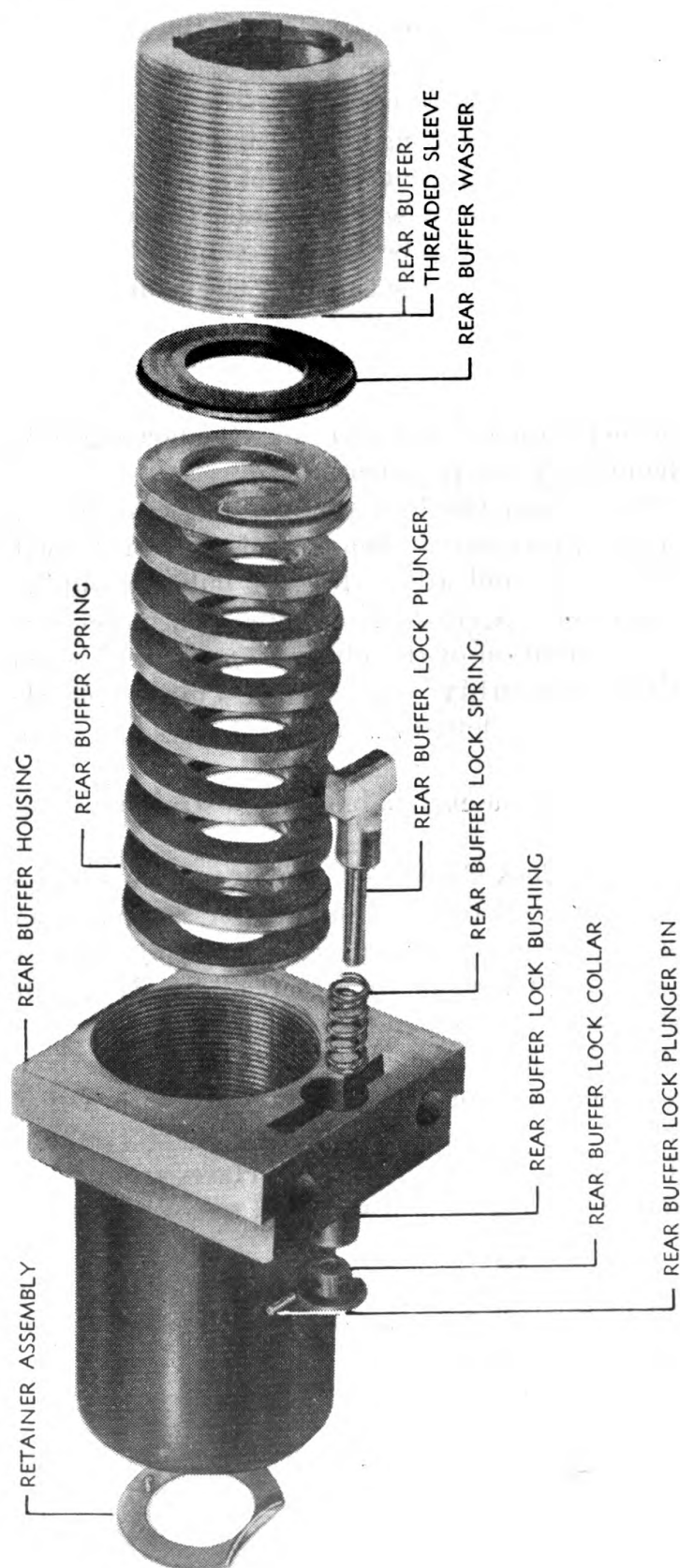
*b.* Remove all burs from the inertia blocks and straighten the guides if necessary.

*c.* Remove left breechblock slide first. Remove all burs and smooth cams on rear with a fine oilstone. Test plunger for movement. If plunger movement is sluggish, remove, clean, and refit. Next remove right slide with key and treat exactly as left slide. If key fits very loosely, remove slide key taper pin and replace the pin.

*d.* Remove lock from bolt. Remove all burs and smooth the locking surface. Finish rough spots on the cam surfaces with a fine grain sharpening stone.

*e.* Withdraw firing pin and remove rough surfaces around key opening. Smooth point of pin with an oilstone and remove all sharp edges or corners.

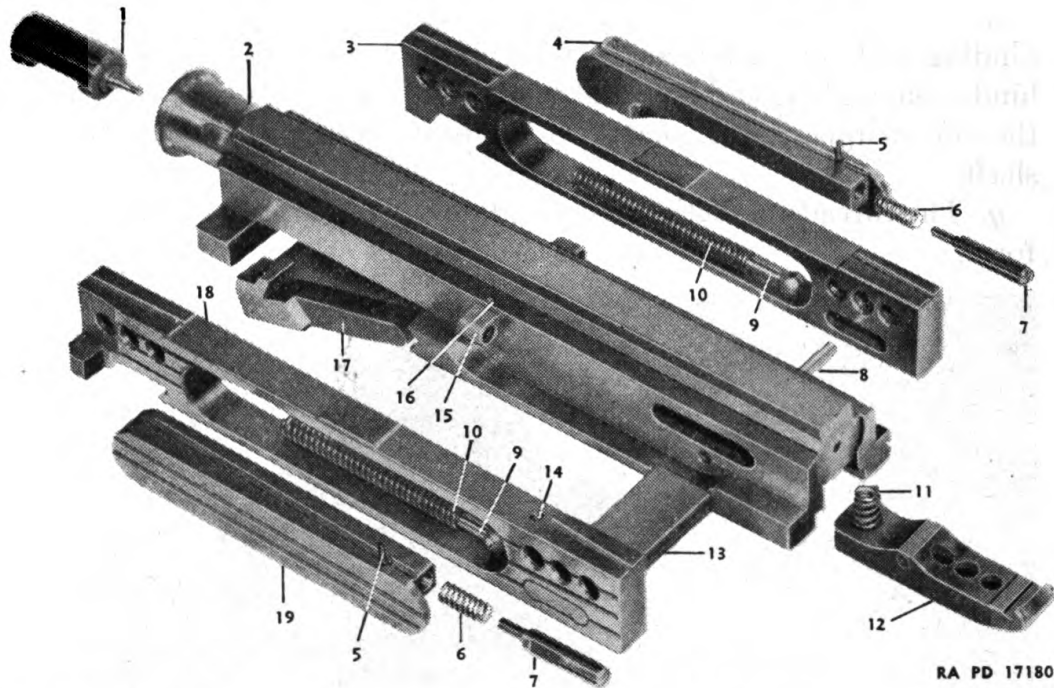
*f.* If firing pin hole is enlarged sufficiently to cause blown primers, replace and refit the bolt. If necessary, finish the passage in top of bolt for clearance of the ejector.



RA PD 17174

Figure 6.—Rear buffer group.





RA PD 17180

- |   |                                      |
|---|--------------------------------------|
| 1. Firing pin.                          | 11. Extractor spring.                |
| 2. Bolt body.                           | 12. Extractor.                       |
| 3. Left breechblock slide.              | 13. Breechblock slide key.           |
| 4. Left inertia block.                  | 14. Breechblock slide key taper pin. |
| 5. Inertia block plunger retaining pin. | 15. Breechblock pin.                 |
| 6. Inertia block plunger spring.        | 16. Breechblock pin taper pin.       |
| 7. Inertia block plunger.               | 17. Breechblock lock.                |
| 8. Extractor pin.                       | 18. Right breechblock slide.         |
| 9. Breechblock slide spring guide.      | 19. Right inertia block.             |
| 10. Breechblock slide spring.           |                                      |

FIGURE 7.—Breechblock assembly.

**14. Sear cover plate group (fig. 8).—a.** Replace any missing or damaged screws which hold sear cover plate to the bottom of receiver. Receiver threads may require chasing out. These threads are 7-mm-1-mm pitch, international form.

**b.** Replace weak sear spring. Do not stretch it except in an emergency.

**c.** Check condition of thread (16-mm-1.5-mm pitch, international form) in plate. If sear spring housing is damaged beyond repair, replace it.

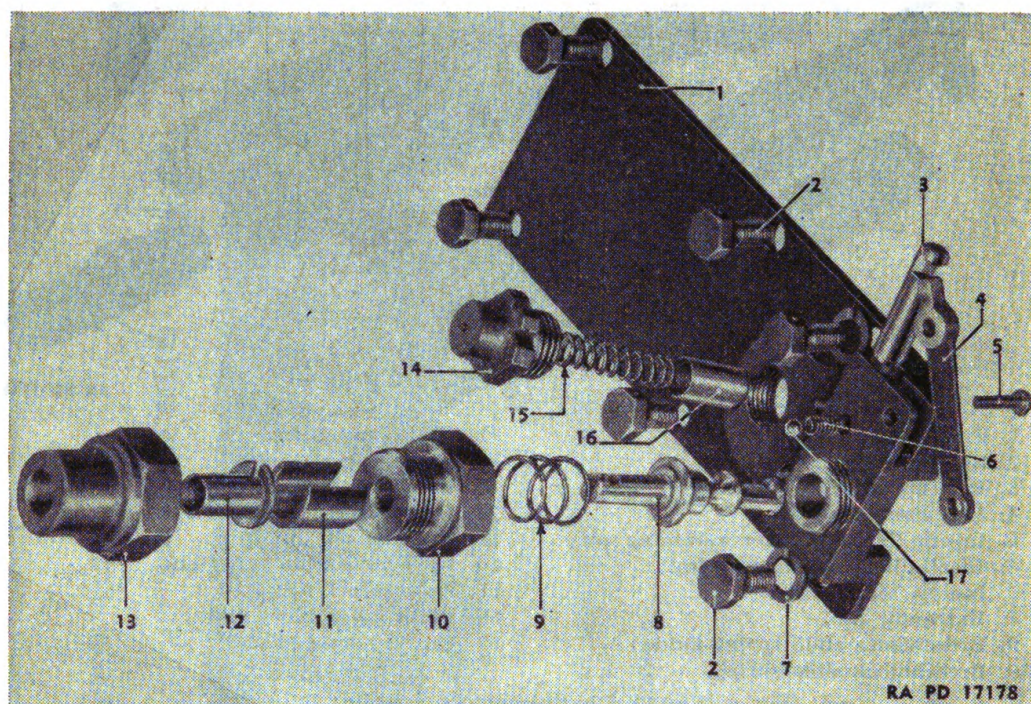
**d.** Withdraw safety lever pin and safety lever. Remove burrs from bottom of safety lever and, if worn, replace and refit to safety pin. Check free movement of safety pin and action of positioning ball. With an oilstone or fine file remove rough, bruised, burred, or binding surfaces and then refit.

**e.** Withdraw bowden connection nut. If it binds or sticks on bowden connection shaft, polish the nut and shaft. If it is cracked or broken, replace it.



f. Grasp bowden connection shaft and actuate by hand to check for binding and spring tension. If spring is weak, replace it. If shaft binds, remove burs and gum and then polish. Use an oilstone to smooth the cam on upper end of shaft. If it is bent, straighten it or replace the shaft.

g. The threads on both nuts are 20-mm-1.5-mm pitch, international form.



- |                                     |                                      |
|-------------------------------------|--------------------------------------|
| 1. Sear cover plate.                | 10. Bowden shaft housing nut.        |
| 2. Sear cover plate screw.          | 11. Outer bowden connection bushing. |
| 3. Safety trigger pin.              | 12. Inner bowden connection bushing. |
| 4. Safety lever.                    | 13. Bowden connection nut.           |
| 5. Safety lever pin.                | 14. Sear spring housing.             |
| 6. Trigger locking pin ball spring. | 15. Sear spring.                     |
| 7. Sear cover plate lock washer.    | 16. Sear spring plunger.             |
| 8. Bowden connection shaft.         | 17. Ball.                            |
| 9. Bowden connection shaft spring.  |                                      |

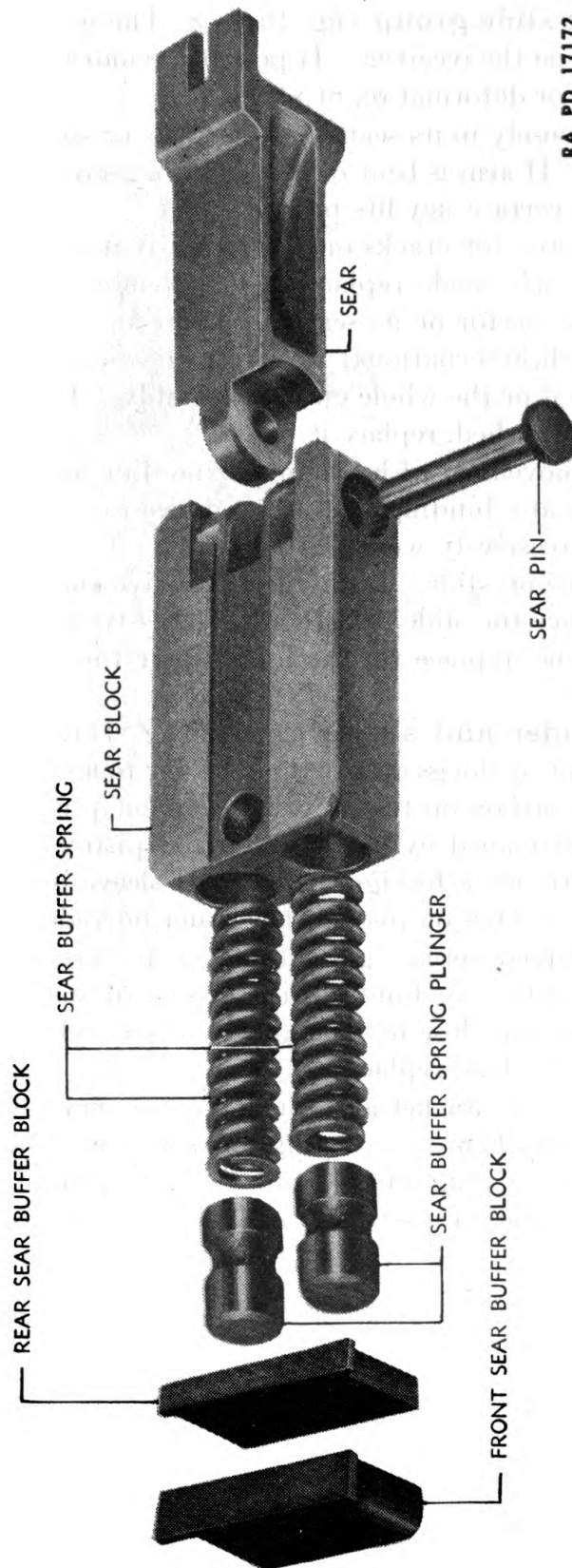
FIGURE 8.—Sear cover plate group.

**15. Sear block group (fig. 9).**—*a.* Stone the sear to shape if burred or wavy. If wear is excessive, replace sear. If extensions on rear of sear show indications of fracture, replace it. Stone cams on rear of sear to fit bowden connection shaft.

*b.* Sear should pivot freely on sear block with very little or no side play. Check free movement of plungers, then invert plungers, and check movement again. If plungers bind, stone them to fit without binding.

*c.* Replace buffer blocks if chipped or cracked. Replace fiber block at least once a year, and more often if necessary.





RA PD 17172

Figure 9.—Sear block group.

**16. Magazine slide group (fig. 10).—***a.* The group should move freely in its ways on the receiver. If possible, remove any binding due to warping, burs, or deformation of parts.

*b.* If arm fits loosely in its seat, tighten, peen, or spread the projecting rib and refit. If arm is bent or distorted beyond repair, replace it and refit, making certain key fits properly.

*c.* Examine ejector for cracks or flaws and, if necessary, replace it. If ejector springs are weak, replace them. Remove all burs, bruises, and binding from ejector or its seat. If necessary, chase out threads (7-mm-1-mm pitch, international form) on the ejector stud. If stud is broken, replace it or the whole ejector assembly. If fiber washer on stud is cracked or crushed, replace it.

*d.* Check free movement of latch, magazine slide lever, springs, and pins. If there is any binding, remove and clean or stone to fit. Replace broken or excessively worn parts.

*e.* Try magazine on slide. If there is excessive end play, it may be necessary to replace the slide. If there is excessive end play between latch and magazine, replace the latch or repair the magazine, as the condition requires.

**17. Gas cylinder and sleeve group (fig. 11).—***a.* Binding or sluggish movement of the gas piston may be due to a number of causes, such as excessive carbon on the gas cylinder vent plug, a bent sleeve, damaged guide, damaged cylinder, or burred piston head. Remove all carbon and any other foreign matter. If sleeve is bent, repair or replace it. Remove burs on piston, if it is not burred excessively. If it is excessively burred, replace gas cylinder piston assembly. Remove dents in guide and burs or binding in rear end of sleeve. The guide should have a medium close fit in rear end of gas cylinder sleeve. If spring is short or kinked, replace it.

*b.* The gas cylinder bracket and plugs require very few repairs, except the chasing out of threads on plugs or in forward end of cylinder. Threads of the vent plug are 14-mm-1.55-mm pitch, international form. Threads of the bracket plug are 10-mm-1-mm pitch, international form.



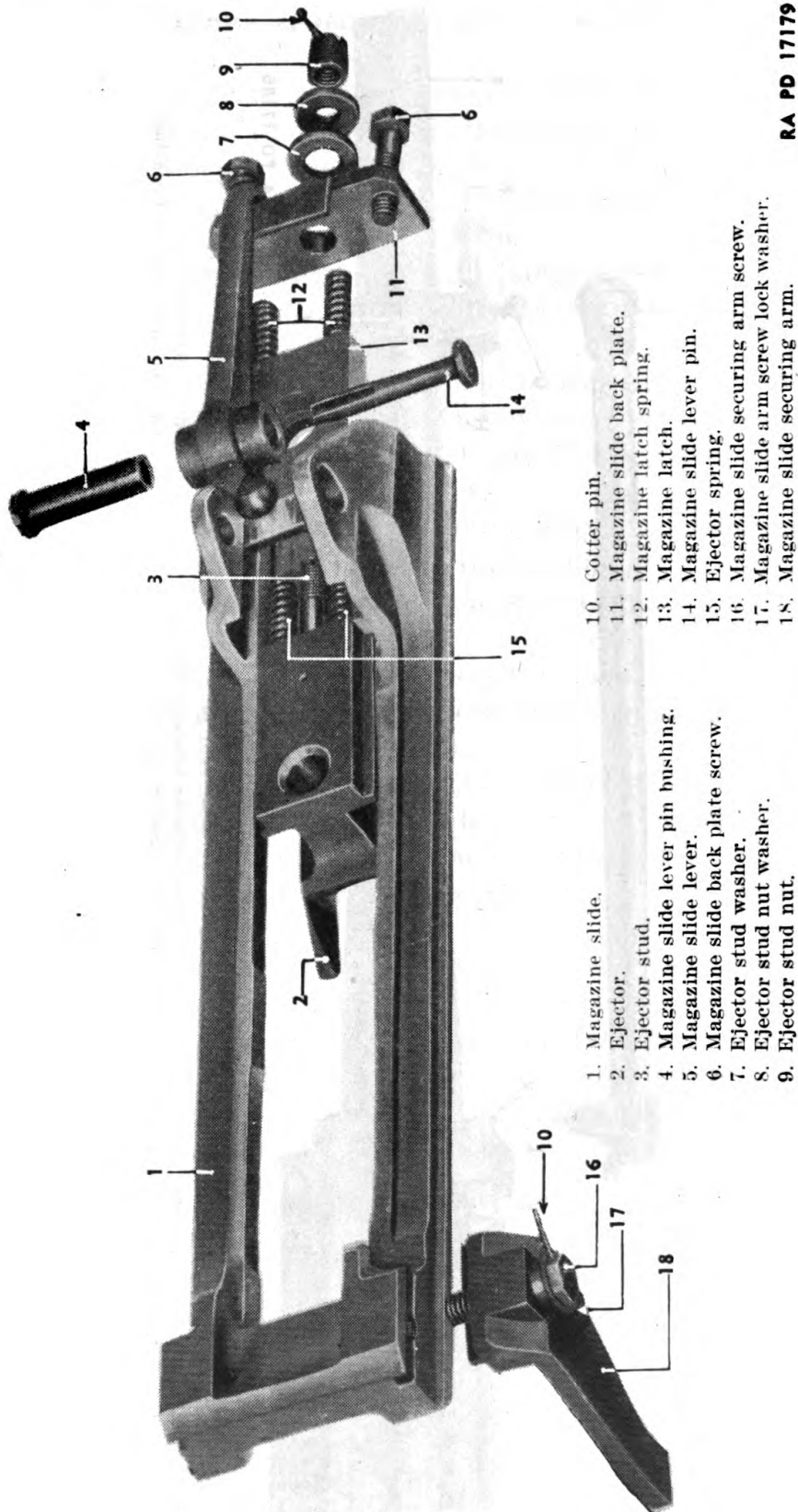
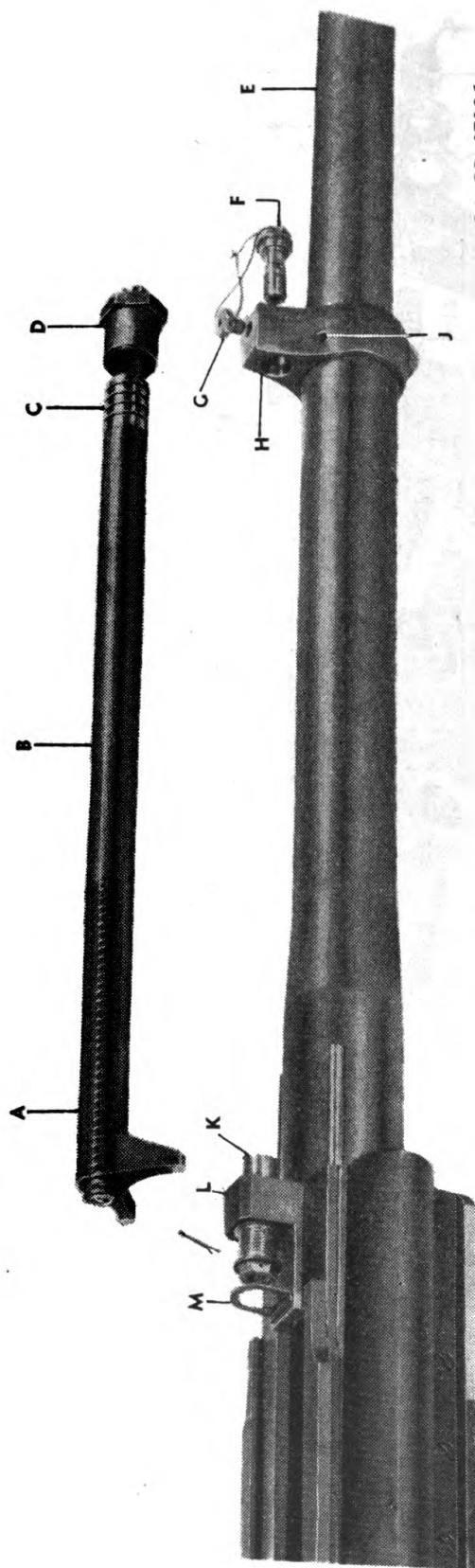


FIGURE 10.—Magazine slide group.

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RA PD 17186

- J. Gas cylinder taper pin.
- K. Gas cylinder guide.
- L. Split cotter pin.
- M. Gas cylinder guide lock washer.

- E. Tube.
- F. Gas cylinder vent plug.
- G. Gas cylinder bracket plug.
- H. Gas cylinder bracket.

- A. Gas cylinder sleeve spring.
- B. Gas cylinder sleeve.
- C. Gas cylinder piston.
- D. Gas cylinder.

FIGURE 11.—Gas cylinder and sleeve group.



**18. Muzzle brake assembly** (fig. 2).—*a.* Chase out threads if burred or dirty.

*b.* If threads of front or rear ferrule, or of the thread protector, are loose, replace the necessary parts. If threads are damaged, chase them out. Ferrule threads which mate with the muzzle brake body are 38-mm-1-mm pitch, international form. Threads of thread protector are 36-mm-2.5-mm pitch, international form.

**19. Recoil spring and mounting sleeve assembly** (fig. 3).—

*a.* Remove any burrs or dents to obtain smooth fit of forward sleeve on tube.

*b.* If recoil spring is distorted or short of free length, replace it.

*c.* Remove burrs from bearing surface of mounting sleeve nut. Check for crossed or torn threads. Threads are 78-mm-2-mm pitch, international form.

*d.* When removing plug from mounting body, clean oil opening with a No. 47 drill. Examine oil fitting in top of plug. If threads in mounting body are damaged, chase them out with a tap of 10-mm-1.25-mm pitch, international form.

*e.* Remove all burrs or rough surfaces from mounting body, dashpot mechanism, and bushing. Polish interior of dashpot with crocus cloth and remove dents, or replace dashpot.

*f.* Remove all burrs from outer surface of piston with an oilstone. Remove all foreign matter from undersurface of piston ring.

*g.* If fiber washer in dashpot is cracked or badly crushed, replace it.

**20. Tube and receiver groups** (fig. 12).—*a.* Stone all scuffed surfaces to remove burrs.

*b.* If tube is loose, use shims made of brass shim stock to tighten it.

*c.* If receiver has cracks or other defects that cannot be repaired to insure complete serviceability of the gun, forward entire gun to a higher echelon for disposition of receiver and parts.

*d.* If chamber has pits, rust, or scratches, remove these defects with a fine oilstone or crocus cloth, as the condition requires.

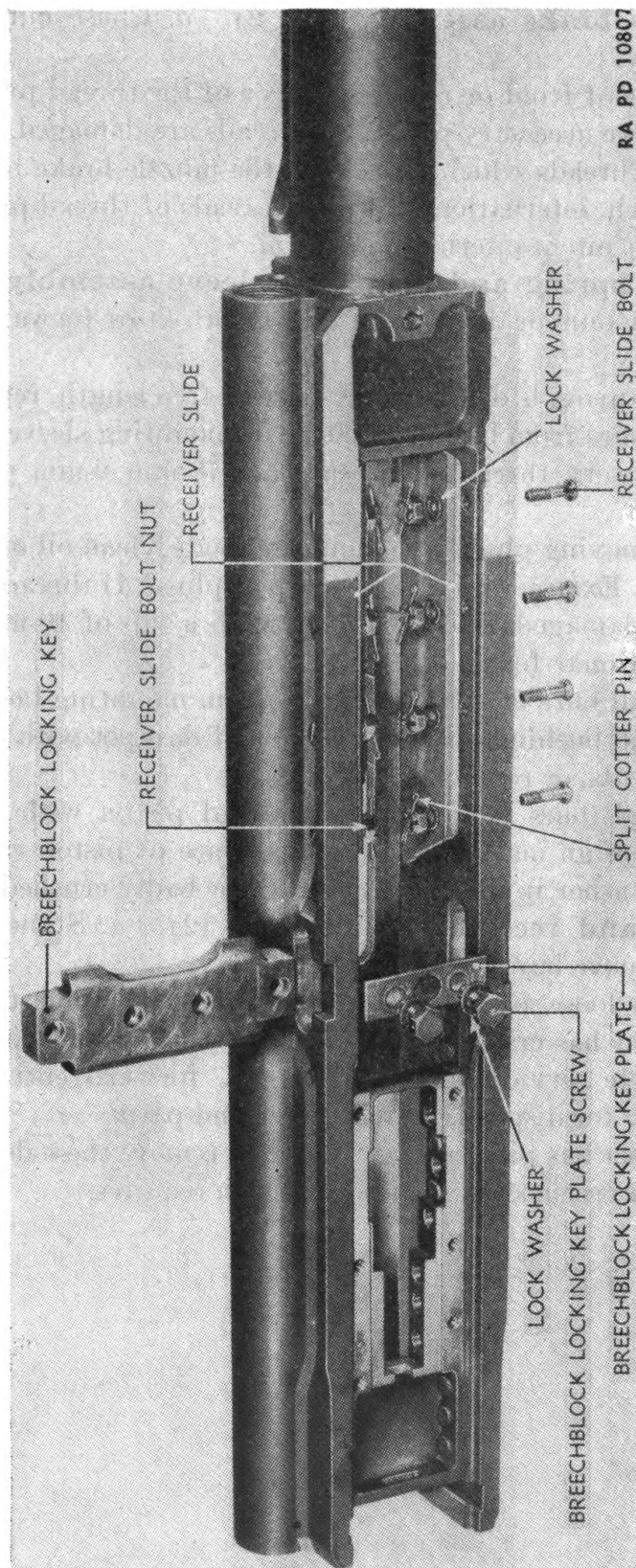


FIGURE 12.—Receiver group.



## SECTION IV

## CARE AND PRESERVATION

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**21. General.**—Because of the extremely low temperatures prevailing at all times at high altitudes, special care must be taken to see that aircraft gun lubricants are kept free flowing. Grease, dried oil, and gum must be very carefully removed before the gun is released for service.

**22. Cleaning.**—*a.* The gun must be disassembled for thorough cleaning and lubrication. In cleaning the bore, use cleaner, rifle-bore, applied with a sponge. If this is not available, use a strong solution of issue soap and hot water. Continue swabbing the bore until a clean flannel patch picks up no foreign matter.

*b.* Clean all moving parts with solvent, dry-cleaning, and wipe dry with a firm cloth. In cleaning oil cups, oil holes, and sliding surfaces, do the necessary wiping with a firm cloth. Do not allow any lint to remain in orifices or on sliding parts.

*c.* Clean gas cylinder bracket and charging cylinder with a brush and then with a flannel patch. Be sure to clean the gas port in the tube and the hole in gas cylinder vent plug with wire #16 American wire gage (AWG—0.050 8-inch diameter).

*d.* Examine all cleaned parts for wear, scores, burs, and cracks; then oil and assemble them.

**23. Lubrication.**—*a.* The life of the gun depends to a great extent on proper lubrication. Give particular attention to lubrication of sliding surfaces of operating mechanism of the gun and other bearing surfaces that do not contain oil holes, plugs, or lubricating fittings.

*b.* Keep grit out of the lubricant and lubricating openings.

*c.* Lubricate bore, chamber, receiver, and other working parts with oil, lubricating, preservative, light. If this is not available, use oil, lubricating, for aircraft instruments and machine guns. However, when the latter lubricant is used, inspection and lubrication must be made at intervals of not more than 24 hours, as this oil has almost no preservative qualities.

*d.* Always lubricate very lightly. Excess oil impairs operation at low temperatures.

APPENDIX

LIST OF REFERENCES

1. **Standard Nomenclature Lists.**

Ammunition, fixed, all types, for pack, light, and medium field artillery----- SNL R-1  
 Cleaning, preserving, and lubricating materials, recoil fluids, special oils, and similar items of issue----- SNL K-1  
 Gun, automatic, 20-mm, M1 and M2----- SNL A-47  
 Soldering, brazing, and welding material, gases and related items----- SNL K-2  
 Truck, small arms repair, M1----- SNL G-72  
 Current Standard Nomenclature Lists are as tabulated here. An up-to-date list of SNL's is maintained as the Ordnance Publications for Supply Index----- OPSI

2. **Technical Manuals.**

Ammunition, general----- TM 9-1900  
 Cleaning, preserving, lubricating, and welding materials and similar items issued by the Ordnance Department----- TM 9-850  
 Ordnance maintenance procedure — matériel inspection and repair----- TM 9-1100  
 20-mm automatic gun M1 and 20-mm aircraft automatic gun AN-M2----- TM 9-227

[A. G. 082.11 (7-1-42).]

BY ORDER OF THE SECRETARY OF WAR:

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*Chief of Staff.*

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(For explanation of symbols see FM 21-6.)











